

WHAT IS CLAIMED IS:

1. A lithium secondary battery with a negative electrode comprising a negative electrode active material layer comprising alloy particles comprising
5 silicon and tin and having an average particle diameter of 0.05 to 2 μm as an active material, and a current collector, wherein the negative electrode active material layer has a storage capacity of 1,000 to 2,200 mAh/g and a density of 0.9 to 1.5 g/cm³.
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2. The lithium secondary battery according to Claim 1, wherein the negative electrode active material layer has a thickness of 10 to 50 μm .
- 15 3. The lithium secondary battery according to Claim 1, wherein the negative electrode active material layer comprises an active material, a binder and a conductive auxiliary material.
- 20 4. The lithium secondary battery according to Claim 3, wherein at least polyvinyl alcohol is used as the binder of the negative electrode active material layer.
- 25 5. A lithium secondary battery comprising a negative electrode comprising a negative electrode active material layer comprising alloy particles as

an active material comprising silicon as a major component and a negative electrode current collector, and a positive electrode comprising a positive electrode active material layer and a positive electrode current collector, wherein the positive electrode active material layer and the negative electrode active material layer satisfy the following relationships:

$$\begin{aligned} & (C_N \times D_N) / (C_P \times D_P) \leq 8 \\ 10 \quad & C_N \times D_N = 1,200 \text{ to } 2,500 \text{ mAh/cm}^3 \\ & C_N = 1,000 \text{ to } 2,200 \text{ mAh/g} \\ & D_N = 0.9 \text{ to } 1.5 \text{ g/cm}^3 \end{aligned}$$

wherein,

C_N represents a capacity per unit weight of the negative electrode active material layer;

D_N represents the density of the negative electrode active material layer;

C_P represents a capacity per unit weight of the positive electrode active material layer; and

D_P represents the density of the positive electrode active material layer.

6. The lithium secondary battery according to Claim 5, wherein the alloy particles comprising silicon as a main component have an average particle diameter of 0.05 to 2 μm .

7. The lithium secondary battery according to Claim 5, wherein the alloy particles comprising silicon as a main component are alloy particles comprising silicon and tin.

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8. The lithium secondary battery according to Claim 5, wherein the negative electrode active material layer has a thickness of 10 to 50 μm .

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9. The lithium secondary battery according to Claim 5, wherein the positive electrode active material layer has a thickness of 50 to 150 μm .

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10. The lithium secondary battery according to Claim 5, wherein the negative electrode current collector has a thickness of 6 to 30 μm .

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11. The lithium secondary battery according to Claim 5, wherein the positive electrode current collector has a thickness of 6 to 30 μm .

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12. The lithium secondary battery according to Claim 5, wherein the negative electrode active material layer comprises an active material, a binder and a conductive auxiliary material.

13. The lithium secondary battery according to

Claim 12, wherein at least polyvinyl alcohol is used as the binder of the negative electrode active material layer.